

**THAT WHICH IS CLAIMED:**

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1. A composition comprising palladium, a selectivity enhancer, and an inorganic support wherein said palladium and selectivity enhancer are each present in a sufficient amount to effect a selective hydrogenation of an unsaturated hydrocarbon, said selectivity enhancer is selected from the group consisting of lead, bismuth, thorium, iridium, gallium, tin antimony, germanium, arsenic, cadmium, mercury, and combinations of any two or more thereof, and said support is selected from the group consisting of silica, alumina, spinel, and combinations of any two or more thereof.
  2. A composition according to claim 1 further comprising silver.
  3. A composition according to claim 1 further comprising an alkali metal or an alkali metal-containing compound.
  4. A composition according to claim 3 further comprising silver.
  5. A composition according to claim 3 wherein said alkali metal-containing compound is an alkali metal halide.
  6. A composition according to claim 4 wherein said alkali metal-containing compound is an alkali metal halide.
  7. A composition according to claim 1 wherein the metal of said spinel is selected from the group consisting of zinc, magnesium, calcium,

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beryllium, strontium, barium, radium, iron, manganese, zirconium, molybdenum, ruthenium, rhodium, cobalt, germanium, tin, and combinations of any two or more thereof.

5 8. A composition according to claim 1 wherein said selectivity enhancer is lead.

9. A composition according to claim 2 wherein said selectivity enhancer is lead.

10. A composition according to claim 1 wherein said selectivity enhancer is bismuth.

11. A composition according to claim 2 wherein said selectivity enhancer is bismuth.

12. A composition according to claim 1 wherein said selectivity enhancer is gallium.

13. A composition according to claim 2 wherein said selectivity enhancer is gallium.

14. A composition according to claim 1 wherein the weight % of said palladium is in the range of from about 0.0001 to about 5%.

15. A composition according to claim 1 wherein the weight % of said palladium is in the range of from 0.001 to 1.5%

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16. A composition according to claim 1 wherein the weight % of said selectivity enhancer is in the range of from about 0.001 to about 10%.

17. A composition according to claim 1 wherein the weight % of said selectivity enhancer is in the range of from 0.003 to 5%

18. A composition according to claim 2 wherein the weight % of said selectivity enhancer is in the range of from about 0.001 to about 10%.

19. A composition comprising palladium, a selectivity enhancer and an inorganic support wherein

said support is selected from the group consisting of silica, alumina, spinel, and combinations of any two or more thereof wherein the metal of said spinel is selected from the group consisting of zinc, magnesium, calcium, beryllium, strontium, barium, radium, iron, manganese, zirconium, molybdenum, ruthenium, rhodium, cobalt, germanium, tin, and combinations of any two or more thereof;

the weight % of said palladium is in the range of from about 0.0001 to about 5%; and

the weight ratio of selectivity enhancer to palladium is in the range of from about 0.1:1 to about 20:1.

20. A composition according to claim 19 wherein said support is alumina; the weight % of said palladium is in the range of from about 0.001 to

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about 1.5%; and the weight ratio of selectivity enhancer to palladium is in the range of from about 1:1 to about 10:1.

21. A composition according to claim 20 wherein said palladium is present as skin distributed on the surface of said alumina and the thickness of said skin is in the range of from 10 to about 300  $\mu\text{m}$ .

22. A composition according to claim 19 further comprising an alkali metal fluoride.

23. A composition according to claim 19 further comprising silver.

24. A composition according to claim 22 further comprising silver.

25. A process comprising contacting a highly unsaturated hydrocarbon, in the presence of hydrogen, with a composition under a condition sufficient to effect selective hydrogenation of said highly unsaturated hydrocarbon to a less unsaturated hydrocarbon wherein said composition comprises palladium, selectivity enhancer and an inorganic support; and said palladium and selectivity enhancer are each present in a sufficient amount to effect hydrogenation of an unsaturated hydrocarbon.

26. A process according to claim 25 wherein said composition further comprises an alkali metal-containing compound.

27. A process according to claim 25 wherein said composition further comprises silver.

28. A process according to claim 25 wherein said support is a spinel and the metal of said spinel is selected from the group consisting of zinc, magnesium, calcium, beryllium, strontium, barium, radium, iron, manganese, zirconium, molybdenum, ruthenium, rhodium, cobalt, germanium, tin, and combinations of any two or more thereof.

29. A process according to claim 25 wherein said support is alumina.

30. A process according to claim 25 wherein said hydrogen is present in said highly unsaturated hydrocarbon.

31. A process according to claim 25 wherein said hydrogen is fed separately and mixed with said highly unsaturated hydrocarbon prior to said contacting with said composition.

32. A process according to claim 25 wherein said selectivity enhancer is bismuth.

33. A process according to claim 25 wherein the selectivity enhancer is gallium.

34. A process according to claim 25 wherein the selectivity enhancer is lead.

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35. A process according to claim 25 wherein said highly unsaturated hydrocarbon comprises a fluid selected from the group consisting of water, steam, water containing a soluble or insoluble substance, and combinations of any two or more thereof.

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